Crown Lengthening: Hands-On Workshop

Timothy Hempton
Welcome to the Greater New York Dental Meeting

Greater New York Dental Meeting™
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Pre-registration is required for all continuing education courses with the exception of the “Live” Dentistry and Affiliated Groups. Your seat will be held for 15 minutes after the start of the course; after that, those without tickets will be seated according to space availability. When the room is filled, no additional people will be admitted due to fire department regulations. If you have not pre-registered, please be prepared to select an alternate session to attend.

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Friday - Wednesday
4 Days of Exhibits
Sunday - Wednesday

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SUNDAY
9:45 - 11:45
VOCO America, Inc.
Drs. Ron Kaminer & Marc Geissberger
Restorative

MONDAY
9:45 - 11:45
Shofu
Drs. Ron Kaminer
Restorative

1:30 - 2:45
First Fit
Drs. Frederick E. Solomon
Cyrus Tahmassebi
Digital

TUESDAY
9:45 - 12:00
Millennium
Dr. Sunil D. Thanik
Laser

12:00 - 2:00 - Ticket 4010
John Quiñones
$125.00

WEDNESDAY
9:45 - 12:00
Ape / Camel, med it
Drs. Michael Ape
Aesthetic

3:00 - 4:15
Benico / Vatech
Dr. Ashok Rajeev Pannalal
Implant

3D Printing & Digital Dentistry Conference
Dental Laboratory
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Sleep Apnea Symposium
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Celebrity Luncheon Speaker
John Quiñones
Monday, December 2nd
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Crown Lengthening Workshop

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Diplomate, American Board of Periodontology

Presented at the Great New York Dental Meeting December 3, 2019
Crown Lengthening Surgery
A surgical procedure that results in clinical exposure of subgingival tooth structure. This periodontal treatment is provided to facilitate restorative/prosthetic therapy.

I. Indications
A. Subgingival Caries
B. Subgingival fracture
C. Inadequate ferrule height
D. To increase retention and resistance form for clinically short teeth
E. To open gingival embrasure spaces
F. Esthetic improvement for teeth with Delayed passive eruption

II. Etiology for clinically short teeth
A. Attrition (occlusal wear)
B. Incomplete passive eruption (delayed passive eruption)
C. Fracture
D. Caries (severe)

III. Techniques for crown lengthening
A. Gingivectomy
B. Flap elevation with osseous resection and apically positioned flaps

IV. Rationale for flap elevation with osseous resection and apically positioned flaps
A. to establish a biologic width (3 mm)
B. to obtain a 1.5 to 2.00 mm ferrule height for a tooth with a foundation restoration
C. To establish positive osseous contours (eliminate osseous deformities)
D. To reduce osseous ledges thereby reducing soft tissue height postoperatively

V. Contraindications
A. Esthetic compromise in the maxillary sextant
B. Compromise to the periodontal support of the teeth involved in the proposed surgery

Summary
The biologic width consists of the Dentogingival Junction and 1 mm sulcus depth. The Dentogingival junction averages 2mm i.e. 1mm Junctional epithelium and 1 mm supracrestal fibrous attachment. Therefore, the biologic width is 3 mm. This should be the occlusal apical distance between the osseous crest and the restorative margin. Crown lengthening can establish this distance and predictably result in periodontal health post restorative/prosthetic treatment. For endodontically treated teeth with foundation restorations, there is an additional concern if the cast restoration does not end on solid tooth structure. A 1.5 to 2.00 mm ferrule height should be obtained. If a tooth treated with a foundation restoration presents with solid tooth structure located at or apical to the free gingival margin, a Crown lengthening procedure should be performed. The occlusal-apical dimensions obtained via the surgical procedure on the buccal and lingual (palatal) should include the following:
3 mm for the biologic width
1.5 to 2 mm for a ferrule height

A Workshop on Osseous Surgery for Crown Lengthening
Osseous surgery has long been utilized as a treatment modality for pocket elimination therapy in the treatment of moderate osseous deformities. The main objective of osseous therapy is to reestablish positive osseous contours which effect the morphology of the overlying gingival tissues during healing. This recontouring results in a relationship such that the osseous crest follows the cementoenamel junctions of the teeth associated with the treated bone. A simplified way of describing positive osseous morphology is that the osseous crest on the approximal surfaces of the invested dentition is apical to the osseous crest in the interproximal areas. This gives the osseous structure a parabolic or scalloped appearance. This appearance occurs as the osseous crest reflects the cementoenamel junctions which rises coronally on the proximal surfaces of the teeth and extends apically on the approximal surfaces. This scalloped appearance is much more pronounced in the maxillary anterior and mandibular anterior sextants than the posterior sextants of both arches.

If osseous deformities are present, osseous resective therapy would be utilized to eliminate these deformities and reestablish positive osseous architecture. Osseous deformities are categorized into one, two, or three wall defects. An additional type of osseous deformity is a dehiscence. Normally the osseous crest is located approximately 2 mm’s from the cementoenamel junction. When this distance is exaggerated on the approximal surface of a tooth, it is described as a dehiscence. Diagrams depicting the four aforementioned types of deformities can be seen accompanying this handout. Diagram # 1 refers to a three wall defect, diagram # 2 refers to a two wall defect, diagram # 3 refers to two types of one wall defects, and diagram # 4 refers to osseous dehiscence.

Osseous resective therapy has been shown through clinical investigation to be an effective form of pocket elimination therapy. Studies by Ammons and Olsen, and Kaldahl and Kalkwarf reveal that a successful treatment outcome can occur in the treatment of moderate to advanced disease when patients are nonsmokers. The overlying gingival topography mimics the underlying osseous contours establishing a minimal sulcus depth. This wound healing relationship has also been verified by Matherson in an animal study.

Osseous therapy can also be utilized to recontour the osseous structure for exposure of additional tooth structure in a crown lengthening procedure. The location of the subgingival caries or fracture is critical in determining how extensive osseous therapy needs to be performed. If the caries or fracture is limited to the direct approximal surface of the tooth, flap therapy may simply be needed only on the approximal surface and need not be extended to the adjacent teeth. As the problem (i.e. fracture or caries) extends toward the interproximal area utilization of a three dimensional approach to solving the osseous problem should be employed.

**Osseous treatment in three dimensions**

The first dimension is the occlusal-apical dimension and the parameter of clinical importance refers to recontouring relative to establishment of the biologic width. The biologic width is a 3 mm distance. The first millimeter establishes the gingival sulcus. The second millimeter is the average length of the epithelial adherence. The third millimeter is the average length of a supracrestal-fiber insertion. This information was determined by a study done by Gargiu-lo in 1961. When an amalgam or composite restoration is treatment planned, the therapist will examine the need to expose 3 mm’s in an occlusal-apical dimension. If prosthetic treatment is planned however, an additional 1 or 2 mm’s is recommended. Crown margins should end on sound tooth structure.

**The mesial-distal dimension.**

As previously mentioned, the mesial-distal dimension becomes involved when the problem extends toward the interproximal area. Under these circumstances, flap design must include not only the tooth involved but also the adjacent teeth (mesial and distal). At this point, re-establishment of positive osseous architecture must occur in order to create a flow of the bone morphology of which the overlying gingival contours will reflect after healing. This establishes minimal sulcus depth and prevents excess tissue formation. It should be noted however that in the case of multirooted teeth, one must be cognizant of the presence of short root trunks. Under these circumstances therapists may simply alter or limit the amount of osseous therapy in order to avoid bone recontouring in the areas of furcations. A therapist may either create two separate parabolas over a furcation area rather than one parabola. By doing so bone in the furcation area is not removed. One could consider the interadicular bone analogous to the interproximal
bone. Another possibility is to limit the osseous therapy toward either the lingual or palatal surfaces. The furcation openings of maxillary molars tend to open more apically than do the buccal furcations. Moreover, the furcation opening of a mandibular molar is more apically positioned on the lingual aspect than the buccal furcation. Under these circumstances osseous recontouring would be, as previously mentioned, limited to the lingual and palatal surfaces thereby preventing exposure of furcation areas on the buccal surfaces.

The buccal lingual dimension.
The presence of exostosis or tori will effect the gingival contour. If the bone is thick the tissue will be more coronally positioned subsequent to healing. Even if an adequate biologic width is established in the first dimension, thick bone will afford a creeping up of the gingival tissue thereby limiting the amount of tooth exposed. In order to compensate for this potential wound healing event, therapists have determined that thick ledging or exostosises should be removed or reduced. By doing so the coronal position of the gingival height is reduced.

In summary osseous therapy can be utilized to eliminate osseous deformities and effect pocket elimination. In addition this treatment can be utilized to expose adequate tooth structure for restorative or prosthetic treatment. Another use for this therapy is for cosmetic surgery. In the instance of incomplete passive eruption, particularly in the maxillary anterior sextant, osseous therapy may be employed so that the gingival margin permanently rests at the cementoenamel junction and does not return coronal to this level.

Osseous Problems - Plastic Model
Today, we present a model which has a fractured maxillary second premolar. In addition, osseous deformities are present in the following locations:

1. A shallow crater located between teeth #’s 4 and 5.
2. A moderate crater between teeth #’s 2 and 3.
3. A shallow 3 wall defect distal to tooth # 3.
4. Thick osseous ledging on the buccal aspect of teeth #’s 2, 3, and 4. An osseous ledge is also present on the palatal aspect in the interproximal area between teeth #’s 2 and 3. It should also be noted that the bone becomes quite thin apically. This is not an uncommon finding.

Our objectives today are to eliminate the two craters, the shallow three wall defect, and reduce the osseous ledging that is present. Moreover, we will obtain crown lengthening for tooth # 4 by a combined elimination of the osseous deformities in conjunction with establishment of a proper biologic width. By doing so, we will expose 4 to 5 mm’s of additional tooth structure from the osseous crest to the fractured portion of the tooth.

The following is a step by step plan for providing this simulated therapy for today’s workshop.

Step # 1. A depth cut is placed on the palatal aspect of tooth # 4. This depth cut establishes a 4 mm distance from the fracture to the osseous crest.
Step # 2. A round bur is utilized to remove osseous tissue at the mesio-palatal aspect of tooth # 5 bringing the bone level into a continuity with the apical base of the crater located between teeth #’s 4 and 5. Additional osseous tissue is removed in the interproximal area establishing the adequate vertical distance between the
base of the interproximal bone and the most apical extent of the fracture on the mesial surface of tooth # 4.

Step # 3. Osseous tissue is removed on the lingual aspect of tooth # 4 establishing a parabolic appearance on the lingual aspect of this tooth.

Step # 4. Osseous tissue is removed at the distal lingual aspect of tooth # 4 extending into the interproximal area. Once again a distance of approximately 4 mm’s is established between the crestal bone located between located between teeth #’s 3 and 4 and the fracture located at the distal palatal aspect of tooth # 4.

Step # 5. Hand instruments can be utilized to smooth off the contours of the bone around teeth #’s 4 and 5.

Step # 6. A round bur is placed at the base of the crater between teeth #’s 2 and 3. That bur is brought palatally through the ledge of bone present between teeth #’s 2 and 3.

Step # 7. Bone is removed on the approximal surfaces of teeth #’s 2 and 3 such that a scalloped appearance is developed on the palatal aspects of these teeth. The osseous crest on both teeth #’s 2 and 3 is now apical to the height of the interproximal bone located between these teeth. Hand instruments can be utilized to refine the osseous removal.

Step # 8. The base of the three wall defect on the distal aspect of tooth # 3 is made confluent with the palatal bone located directly medial to this area. The distal molar bone is then recontoured establishing a relationship such that the bone distal to tooth # 2 is coronal to the bone on the direct palatal aspect of this tooth. By utilization of this ramping technique positive osseous contours are established at the distal aspect of tooth # 3. At this point when viewing the osseous tissues on the palatal aspect of the model, the interproximal bone should be located coronal to the bone on the approximal surfaces of teeth #’s 2, 3, 4, 5, and 6.

Step # 9. Our attention is now turned toward the buccal aspect. Ledging will be reduced on the buccal aspect of teeth #’s 2, 3, and 4 with a round bur. By thinning out the bone, the overlying gingival tissues will be effected in such a fashion that there will be less coronal gingival growth during the healing process. This will result in minimal sulcus depth.

Step # 10. We examine the interproximal area between teeth #’s 3 and 4 from the buccal aspect. Elevation of the buccal flap has enabled us to remove the osseous ledging however, it also affords us the opportunity to correct the contours between teeth #’s 3 and 4 on the buccal aspect. A final examination is given between a relationship between the relationship of the osseous crest and the fractured area between teeth #’s 3 and 4. Final recontouring is done in this area.

The primary objective was to create an occlusal apical dimension around tooth # 4 such that we would have established an adequate biologic width (3 mm’s) as well as additional tooth structure for prosthetic treatment. Moreover, we have eliminated the shallow crater between teeth #’s 4 and 5, the moderate crater between teeth #’s 2 and 3, and the shallow three wall defect distal to tooth # 2. At this point the osseous problems associated with this model have been solved. Osseous recontouring has eliminated the osseous deformities while concurrently providing additional tooth structure around tooth # 4 for prosthetic treatment. This goal has also been achieved in conjunction with osseous recontouring for pocket elimination therapy.
Bibliography

Smith D, Ammons W, van Belle G. A longitudinal study of periodontal status comparing osseous recontouring with flap curettage. II. Results after 6 months. *J. Periodontol* 1980; 51:367-375


Libman WJ, NichollsJI : Load Fatigue of teeth restored with with cast posts and cores and complete crowns, Int J Prosthodont 8:155, 1995

Tooth preparation with a Ferrule and a tooth preparation without a Ferrule

Fig. 12-11. Extending a preparation apically creates a ferrule and helps prevent fracture of an endodontically treated tooth during function. A, Prepared with a ferrule (arrow); B, Prepared without a ferrule.

Fig. 7. Flexible post may allow micromovement of core (small arrow) under occlusal load (large arrow) when ferrule is small or absent with resultant fracture of cement seal at crown margin (curved arrow).

No ferrule results in dispersion of occlusal forces to the cement, which retains the foundation restoration. This can result in cement fatigue and eventually prosthetic failure i.e. recurrent caries or root fracture.
Osteoplasty: Removal of nonsupporting bone.
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For endodontically treated teeth with foundation restorations, there is an additional concern if the cast restoration does not end on solid tooth structure. A 1.5 to 2.00 mm ferrule height should be obtained. If a tooth treated with a foundation restoration presents with solid tooth structure located at or apical to the free gingival margin, a Crown lengthening procedure should be performed. The occlusal-apical dimensions obtained via the surgical procedure on the buccal and lingual (palatal) should include the following;

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1.5 to 2 mm for a Ferrule Height
Policy Statement

**Surgical Clinical Crown Lengthening**

Caries, fracture of a tooth, following removal of an old restoration, external or internal root resorption, uneven occlusal planes or excessive occlusal or incisal wear may result in insufficient clinical crown length or tooth volume to support a restoration without impinging upon the biologic width of the periodontal attachment to the tooth. The combined measurement of the sulcus depth and biologic width is minimally three millimeters. Placement of a restoration that invades the biologic width may result in inflammation and loss of support. In order to maintain periodontal health and restorative retention form, there should be adequate exposure of sound tooth structure for the restoration of the tooth.

Surgical clinical crown lengthening is often necessary to obtain adequate sound tooth structure. This procedure involves surgical reflection of mucoperiosteal flaps with osseous recontouring through ostectomy and osteoplasty. Clinical crown lengthening (04249) is performed in a healthy periodontal environment, in contrast to osseous surgery, (04260) which is performed to treat periodontal osseous defects. When there are adjacent teeth, surgical clinical crown lengthening of a single tooth involves a minimum of three teeth in order to avoid unhealthy, inconsistent gingival margins and alveolar bone contours.

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**Periodontal Crown Lengthening D 4249** There is no periodontal disease

There is No Bone Loss and there are No Pockets

**Osseous Surgery D 4260** There is periodontal disease with Bone Loss and Pockets
Case presentation of a Crown lengthening for a Maxillary Premolar

Pre-treatment Buccal view

Pre-treatment Palatal view

Buccal Incision

Palatal Incision

Buccal Pre-osseous

Buccal Post osseous

Palatal Pre-osseous

Palatal Post-osseous